

2-2 Logic

Statement-Sentence that is either true or false, but not both

Truth value-whether it is true or false

Negation-opposite meaning as well as opposite truth value (Symbol \sim)

Example:

p: September has 30 days. T

not p or $\sim p$:

September does not have 30 days.

(The letters p, q, and r are typically used to represent statements.)

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Compound statement--

combine 2 or more statements
using AND or OR.

q: September is the 9th month of the year.

p and q:

September has 30 days and
September is the 9th month
of the year.

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AND-conjunction Symbol \wedge $p \wedge q$ "p and q"

True,
when Both statements are True

False,
when either or both statements are False

T : A square has 4 congruent sides.

True or False

$p \wedge q$ T $p \wedge r$ T $\sim p \wedge r$ F
 T T T T F T

OR-disjunction Symbol \vee $p \vee q$ "p or q"

True,
when either statement is True (or both)

False,
when both statements are False

True or False

$p \vee q$ T $\sim p \vee \sim r$ F $\sim q \vee r$ T
 T T F F F T

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Complete the following example on your own.

p : \overline{AB} is proper notation for "line AB" T F

q : centimeters are metric units T F

r : 9 is a prime number F

Determine the truth value for #s 1-5.

1. $p \vee q$ T 2. $r \vee q$ T 3. $p \wedge q$ F

4. $\sim p \vee q$ T 5. $p \vee r$ F
 T T F F

Truth Tables

Negation	
p	$\sim p$
<u>T</u>	<u>F</u>
<u>F</u>	<u>T</u>

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Conjunction			Disjunction		
p	q	$p \wedge q$	p	q	$p \vee q$
T	T	T	T	T	T
T	F	F	T	F	T
F	T	F	F	T	T
F	F	F	F	F	F

Tautology-Compound sentence that is always true.
Ex: You are in school, or you are not in school.

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$\sim p \vee q$

p	q	$\sim p$	$\sim p \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

$\sim p \wedge \sim q$

p	q	$\sim p$	$\sim q$	$\sim p \wedge \sim q$
T	T	F	F	F
T	F	F	T	F
F	T	T	F	F
F	F	T	T	T

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3 Terms
 $p \vee (\sim q \wedge r)$

p	q	r	$\sim q$	$\sim q \wedge r$	
T	T	T	F	F	T
T	F	T	T	T	T
T	T	F	F	F	T
T	F	F	T	F	T
F	T	T	F	F	F
F	F	T	T	T	T
F	T	F	F	F	F
F	F	F	T	F	F

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$(p \vee q) \wedge \sim r$

p	q	r	$\sim r$	$(p \vee q)$	
T	T	T	F	T	F
T	F	T	F	T	F
T	T	F	T	T	T
T	F	F	T	T	T
F	T	T	F	T	F
F	F	T	F	F	F
F	T	F	T	T	T
F	F	F	T	F	F

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HW
p72-73
18-29(T or F only),
30-32

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